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fluids seek their level, bodies grow cold, never hot, of themselves. If *I* determined these events, they would often take place differently. Consequently, if there is a mind or will which directs the universe, it is a remarkably single-minded one, and a rigid one, and so much higher than our feeble and wavering will that it would be much better if we should compare ourselves to it rather than make it an image of ourselves.

It only remains to be said that Professor Knight's solution of the problem of the universe is also a henistic one, in the sense in which that word was explained in the last *Monist*. The Infinite or God is a great sea of imperishable, invisible essence, in which man and nature, "all the choir of heaven and the furniture of the earth," float.

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THE EVANSTON COLLOQUIUM. LECTURES ON MATHEMATICS. By *Prof. Felix Klein*.

Reported by Alexander Ziwet. New York and London: Macmillan & Co. 1894. Pp. 109. Price, \$1.50.

One of the most prominent mathematicians who attended the recent Congress of Mathematics at Chicago was Prof. Felix Klein, of the University of Göttingen, Commissioner of the German University Exhibit at the Columbian Exposition. After the adjournment of the Congress, Professor Klein, by special request, held a colloquium on mathematics in the Northwestern University, at Evanston, Illinois. The meetings lasted from August 28 until September 9, during which interval Professor Klein delivered twelve lectures. As the lectures were delivered to members of the Mathematical Congress, they are somewhat in the nature of a supplement to the proceedings of the Congress, which will explain the incompleteness of their character. At the end of the lectures a translation is printed of the historical sketch, "Mathematics at the German Universities," contributed by Professor Klein to the great two-volume work of the German Exhibit, *Die deutschen Universitäten*, mention of which is made in *The Monist* of October, 1893. This sketch brings the subject down to 1870; it is the object of the Colloquium, therefore, to pass in review some of the principal phases of the most recent development of mathematical thought in Germany.

The first six lectures are largely geometrical in character. Lecture I is devoted to Clebsch, whose most valuable work is said to be his generalisation of the whole theory of Abelian integrals to a theory of algebraic functions with several variables; Lectures II and III, to Sophus Lie, whose forte is said to be the application of geometrical intuition to questions of analysis, best expressed in his earliest memoirs. Lecture IV is devoted to "The Real Shape of Algebraic Curves and Surfaces." Professor Klein sets up three chief types of mathematicians, namely: logicians, formalists, and intuitionists. He classes himself among the third and first. The intuitionist feature of his mind is exhibited in the present lecture, to the subject of which he has personally contributed much. The characteristics of the geometrical method as discussed in this lecture are that they give an actual

mental image of the configuration under discussion, a feature which Professor Klein considers the most essential in all true geometry. Lecture V is on "The Theory of Functions and Geometry," where an example is given of the general discussion of complex functions by means of geometry.

Lecture VI, "On the Mathematical Character of Space-Intuition, and the Relation of Pure Mathematics to the Applied Sciences," is that of greatest interest to the philosopher and teacher. Professor Klein refers here to his distinction of *naïve* and *refined* geometrical intuition, the first of which is active in all periods of genesis, and the latter in all periods of criticism. For example, the period of Euclid was that of the refined intuition; for his methods are not methods of discovery, but simply methods of confirmation. He applies this distinction to modern mathematical disciplines, and also gives us some excellent remarks on the theory of knowledge and on methods of mathematical instruction. The problem, also, whether the study of mathematics should have wholly utilitarian ends in view is here touched upon, as it is also in Lecture XII. Professor Klein is conscious "of a growing danger in the higher educational system of Germany,—the danger of a separation between abstract mathematical science and its scientific and technical applications." He says, such a separation is only to be deplored; "for it would necessarily be followed by shallowness on the side of the applied sciences, and by isolation on the part of pure mathematics." A comparison of the relative fruitfulness of the mathematics of the eighteenth century, which was developed almost wholly in connexion with practical problems, with that of the nineteenth, will strengthen this view. Still, Professor Klein requests that his remarks be not interpreted as in any way prejudicial to the cultivation of mathematics as a purely disciplinary, abstract science having ends in itself. It may be interesting to our readers to know that Professor Klein recommends Kiepert's new edition (the sixth) of Stegemann's text-book of the Differential and Integral Calculus\* as the best work for beginners; and that he regards the second edition of Jordan's *Cours d'analyse* as marked by too much refinement in the laying of the foundations of the calculus to be placed in the hands of a beginner, although for professional mathematicians works like Jordan's are indispensable.

Lecture VII treats of "The Transcendency of the numbers  $e$  and  $\pi$ ," of Hermite and Lindemann's investigations, with which the readers of *The Monist* are familiar (See *The Monist*, Vol. I, No. 2, p. 227). Lecture VIII treats of "Ideal Numbers," where elementary geometrical interpretations of binary algebraical forms by means of line-lattices, point-lattices, etc., are given. Lecture IX treats of "The Solution of Higher Algebraic Equations"; Lecture X of "Some Recent Advances in Hyperelliptic and Abelian Functions"; Lecture XI of "The Most Recent Researches in Non-Euclidean Geometry." Lecture XII is entitled "The Study of Mathematics at Göttingen"; and as Professor Klein's Göttingen lectures are of spe-

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\* *Grundriss der Differential- und Integral-Rechnung*, Hannover: Helwing. 1892.

cial interest to American students we shall quote here a statement in connexion with American students to which Professor Klein wishes the widest publicity to be given :

"It frequently happens at Göttingen, and probably at other German universities as well, that American students desire to take the higher courses when their preparation is entirely inadequate for such work. A student having nothing but an elementary knowledge of the differential and integral calculus, usually coupled with hardly a moderate familiarity with the German language, makes a decided mistake in attempting to attend my advanced lectures. If he comes to Göttingen with such a preparation (or, rather, the lack of it), he may, of course, enter the more elementary courses offered at our university; but this is generally not the object of his coming. Would he not do better to spend first a year or two in one of the larger American universities? Here he would find more readily the transition to specialised studies, and might, at the same time, arrive at a clearer judgment of his own mathematical ability; this would save him from the severe disappointment that might result from his going to Germany."

The spirit of these colloquia make up somewhat for their incompleteness. It would seem as if most of the hearers were quondam students of Professor Klein, as his attitude and tone is that of an old teacher.

T. J. McC.

A HISTORY OF PHILOSOPHY, With Especial Reference to the Formation and Development of Its Problems and Conceptions. By *Dr. W. Windelband*. Authorised translation by *James H. Tufts*, Ph. D. New York and London : Macmillan & Co. 1893. Pp. 640. Price \$5.00.

There could be no question of the necessity of a translation of Dr. Windelband's "History of Philosophy." The work, which appeared as recently as 1891, met with a very favorable reception in Europe, and possesses many excellences by which it may be favorably compared with the other standard text-books upon this subject. It is not a mechanical re-elaboration of the subject-matter of the history of philosophy, but is based upon many new commendable points of view, both of form and conception. As distinguished from most other manuals of this subject, it gives little space to biographical and bibliographical details, but devotes the main part of its expositions to the presentation of the motives under which our notions of the universe and of life have been developed. This excellence of form has been enhanced by the typographical execution of the translated work, where the matter is so arranged that the student has every advantage that mechanical means can supply, among which we must not omit to notice a good index.

If the reader of this volume is disappointed in some respects, (though there are as many counter-aspects in which he will be pleased,) his disappointment will spring from reasons which the author well defends. Little emphasis has been placed upon the individuality of thinkers, and we miss that inspiration which always attaches itself to the activities of persons. It is what the Germans call a "scientific" exposition, and we may also say it is an *academical* one. This characteristic point of